RESEARCH DEPARTMENT

U.H.F. AERIALS FOR THE HERTFORD TELEVISION RELAY STATION

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INTRODUCTION

The Hertford Type 2 u.h.f. relay station came into service on 11th October 1965. It provides a television service on BBC-2 to the towns of Hertford and Ware.

SUMMARY OF INSTALLATION

Site: The site is at Bengeo Water Tower, on the north-western outskirts of Hertford, grid reference TL/321138, height 200 ft (61 m) a.m.s.l.

Support Structure: The transmitting aerial is supported within a 36 ft (11 m) long, 15¼ in. (387 mm) diameter glass fibre cylinder, mounted on top of the water tower. The receiving aerial is mounted on the parapet of the water tower.

General Arrangement: See Fig. 1.

Channels: The transmitting aerial is designed to radiate on four channels simultaneously. The BBC channels are 58 and 64 of which the latter is to be used for the opening service. The ITA channels are 54 and 61. All channels will have zero offset.

TRANSMITTING AERIAL

The aerial, shown in Fig. 2, consists of 16 tiers each of a single vertical dipole mounted on a 3 in. × 1½ in. (76 mm × 38 mm) metallic channel section. The dipoles are oriented on a bearing of 135° ETN.

Feeders: The feeding arrangement is shown schematically in Fig. 3. The halves of the aerial are fed through separate main feeders type Hackethal HF 1 5/8 in. (50 ohm). Distribution feeders type UR67 connect the dipoles to 8-way transformers mounted at the base of the aerial.

Power:

At present only transmitters for Channel 64 have been installed. These consist of a Pye 50 W travelling-wave-tube amplifier for the initial low-power operation and a Pye 5 kW Klystron amplifier for full-power operation; each will be used as a common amplifier for the sound and vision signals. The station has opened with a peak vision transmitter power of 40 W; this will be increased to 70 W and 140 W (both from the Klystron amplifier) as Waltham-on-the-Wolds and Mendip Forest (the principal interfering co-channel stations) come into operation. At a later date, when the four-channel combining units are installed, the power will be increased to 180 W.

Templet and horizontal radiation pattern (h.r.p.):

See Fig. 4 and Note 1. The variation of h.r.p. over the frequency band is shown in Fig. 5.

Vertical radiation pattern (v.r.p.):

See Fig. 6 and Note 2.

Gain:

The following figures apply to the initial low-power operation on one channel but are valid for all four channels:

Mean intrinsic gain		12·7 dB
Deduct losses:		
Gapfilling	0·7 dB	
Distribution feeder	1·5 dB	
Distribution transformer	0·1 dB	2·3 dB
Mean net gain		10·4 dB
Deduct losses:		
Main feeder 111 ft (34 m) HF 1 5/8 in.	0·8 dB	
Feeder ground run 15 ft (4 m) UR67	0·9 dB	
Diplexer	0·1 dB	1·8 dB
Mean effective gain		8·6 dB
H.R.P. maximum/mean ratio		2·5 dB
Maximum effective gain		11·1 dB

At the first increase of power, the ground run of feeder type UR67 will be replaced by 33 ft of feeder type HF 7/8 in., loss 0·4 dB giving:

Maximum effective gain	11·6 dB

RECEIVING AERIALS

For the initial service, main and standby receiving aerials, Associated Aerials (GSV Division) Type 100, are mounted on the water tower at a height of 94 ft (29 m) a.g.l. At an early date these will be replaced by aerials consisting of a horizontal array of dipoles in a trough reflector, mounted at the same height and having the following performance:-

Frequency range	Channels 21 - 34
Polarization	Horizontal
Horizontal beam-width to half-power points	± 8·5°
Intrinsic gain	14·0 dB
Feeder loss	4·5 dB
Effective gain	9·5 dB

The parent station is Crystal Palace, channels 23, 26, 30 and 33. The field strength of Channel 33 at 97 ft (29·6 m) a.g.l. is 85 dB (1μV/m).

Coupling between aerials: The coupling between the transmitting aerials and the temporary receiving aerials is not greater than -80 dB.

Notes:

1. H.R.P. measurements were carried out on a full-scale prototype half-aerial mounted in a glass-fibre cylinder.
2. The v.r.p.s have been computed from the designed values of the radiating currents in each tier for the centre frequency and ± 10% on this. Probe measurements on the prototype aerial showed that the design values would be achieved within the accuracy of measurement.

ACKNOWLEDGEMENT

The transmitting aerials were constructed by Equipment Department and installed and set to work by Planning and Installation Department.

REFERENCE

Detailed information on the construction and dimensions of the aerials is given on the following Research Department drawings:

RG 35839	-	Dipoles
RC 35858	-	Support channel
RA 21067 etc.	-	Distribution transformer
RJ 35928	-	r.b.r. trough reflector
RA 21240 etc.	-	r.b.r. distribution transformer

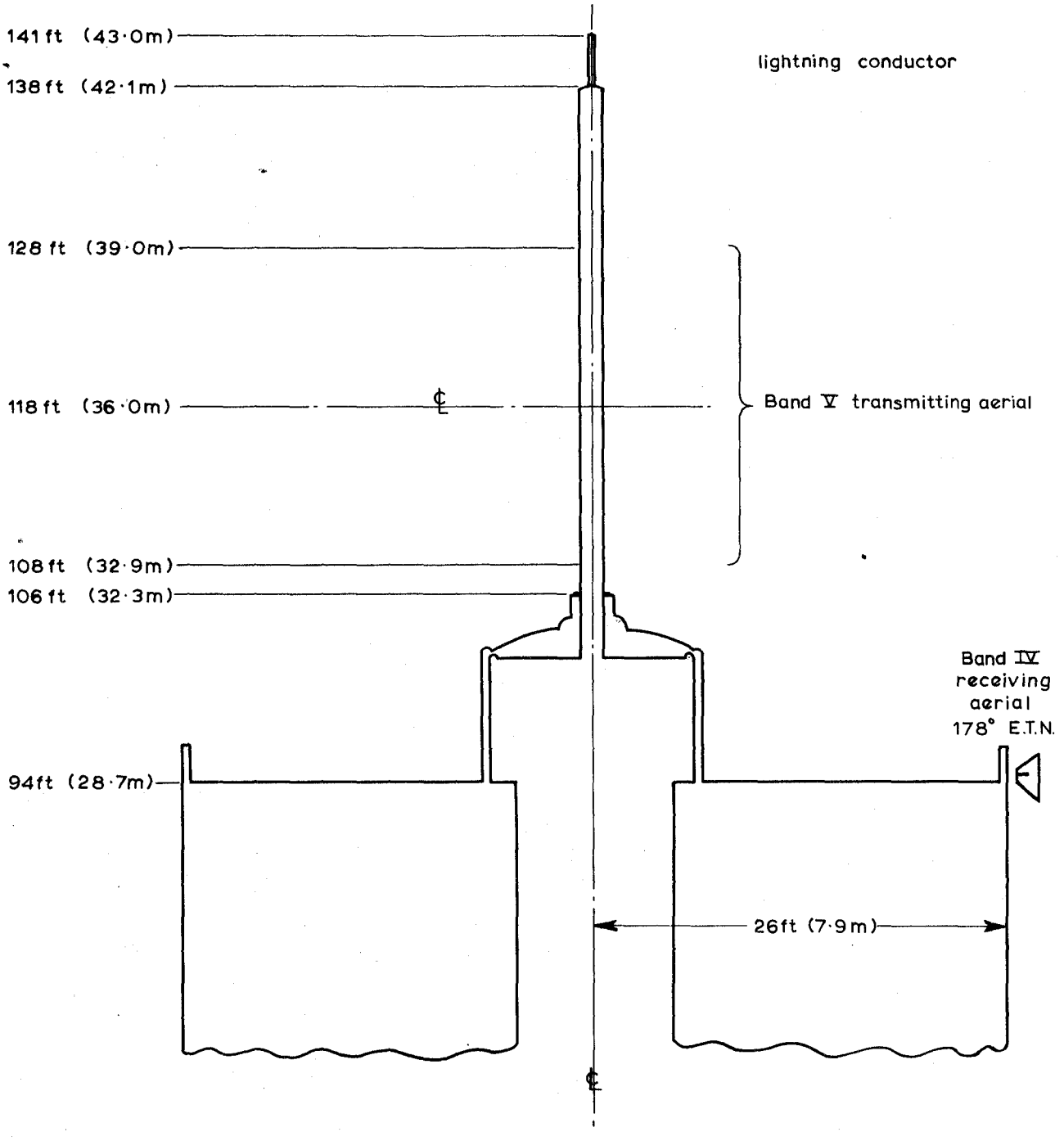

Fig 1. General arrangement of aerials on water tower

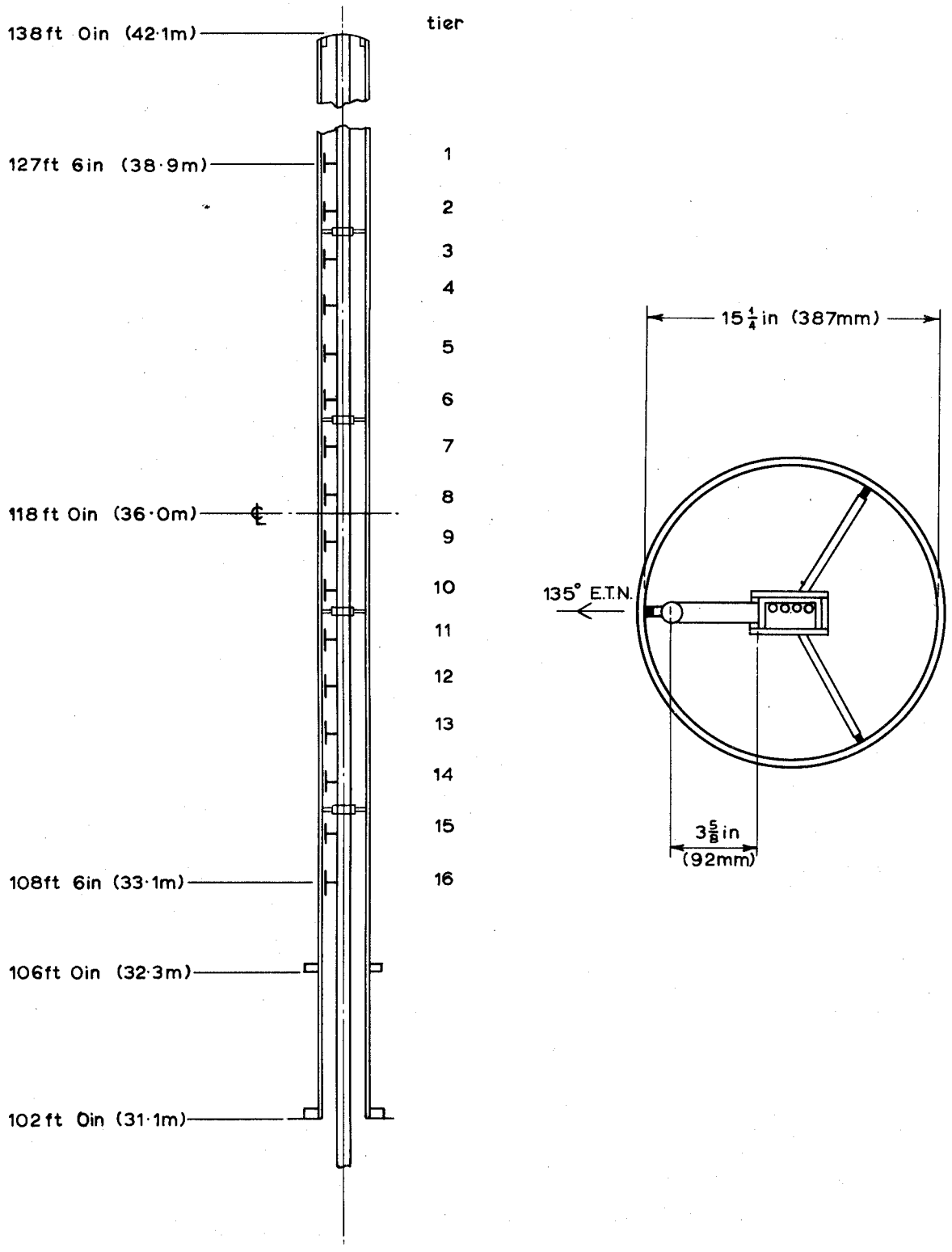

Fig.2. Arrangement of transmitting aerial

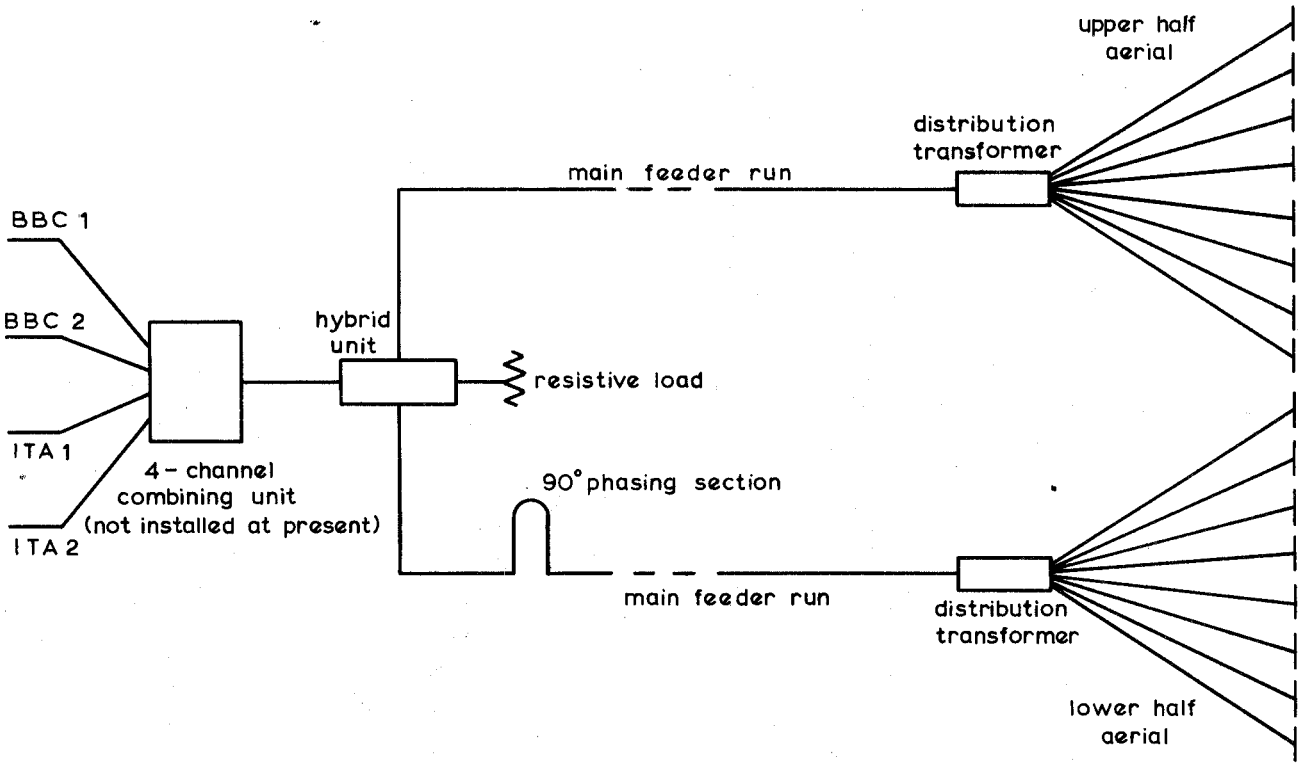

Fig. 3. Schematic of feeding arrangement for transmitting aerial.

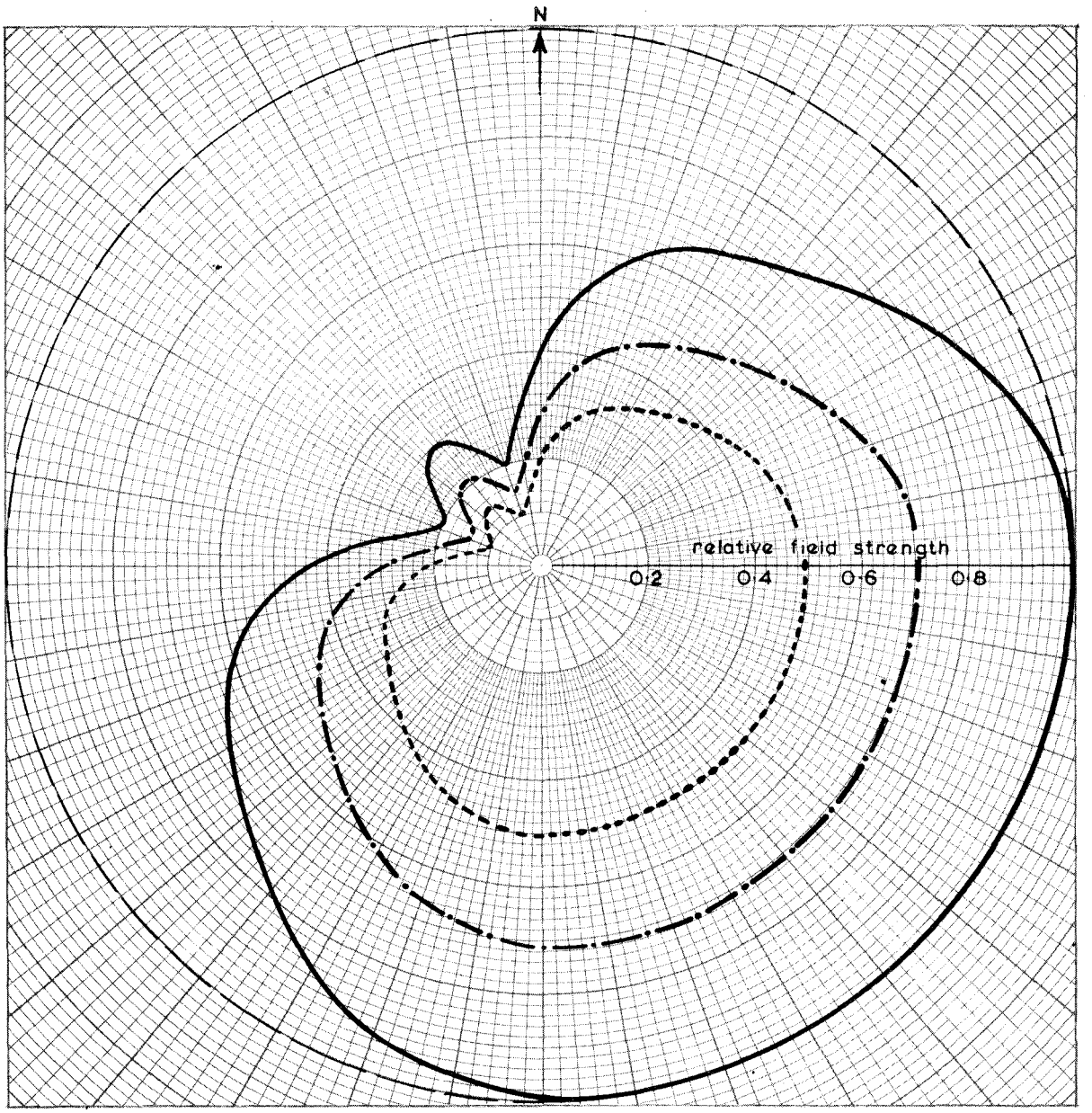

Fig. 4. Horizontal radiation pattern

VERTICAL POLARIZATION

---------- Transmitter power: 40W
Mean E.R.P: 0·28kW

—·—·—·— Transmitter power: 70W
Mean E.R.P: 0·56kW

———— Transmitter power: 140W
Mean E.R.P: 1·12kW

—— —— —— Maximum E.R.P. required for type 2 station.

Unit field corresponds to an E.R.P. of 2kW

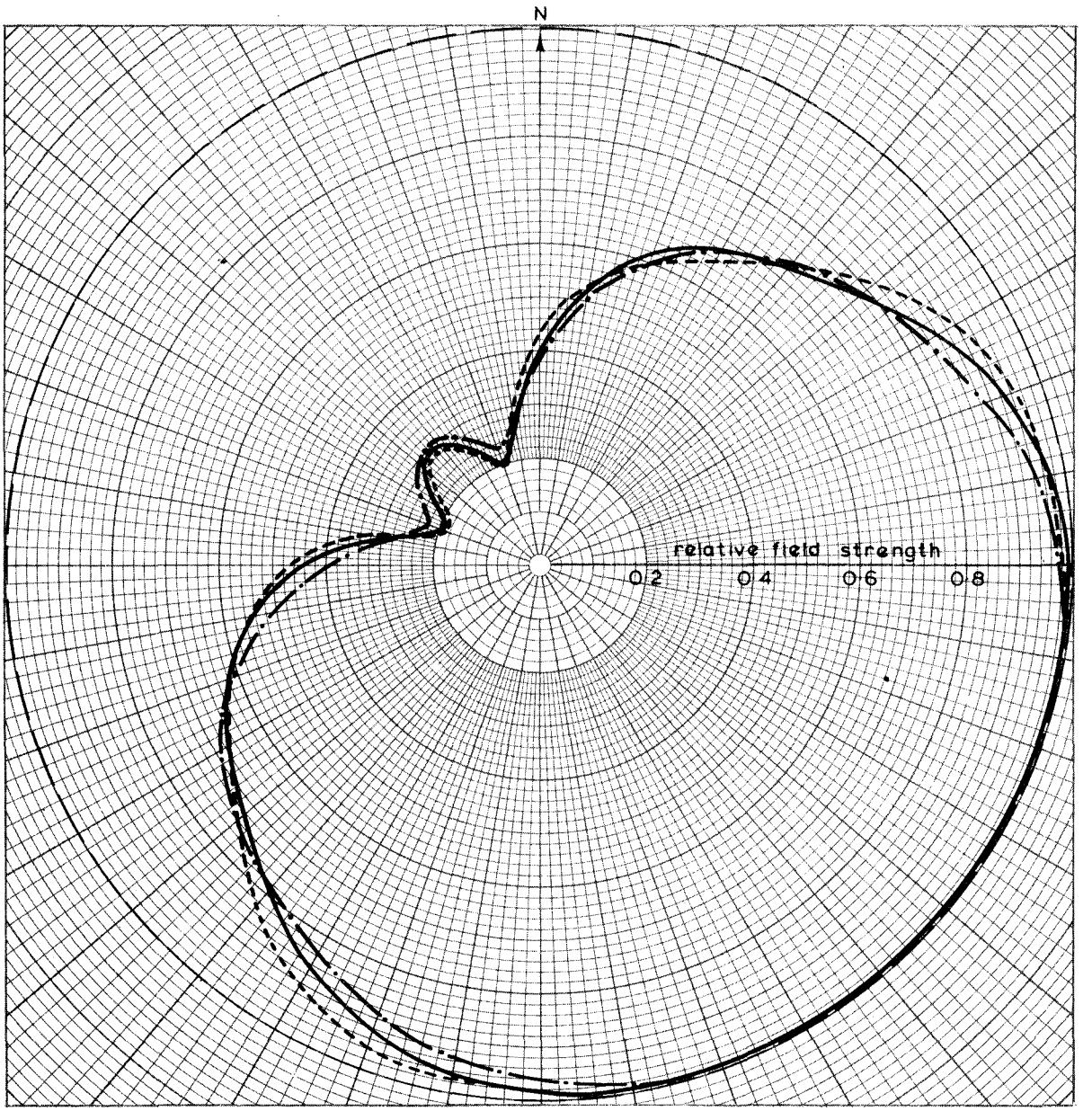

Fig. 5. Variation of horizontal radiation pattern with frequency

730 Mc/s

790 Mc/s

850 Mc/s

Maximum E.R.P. required for type 2 station.

Unit field corresponds to an E.R.P. of 2kW

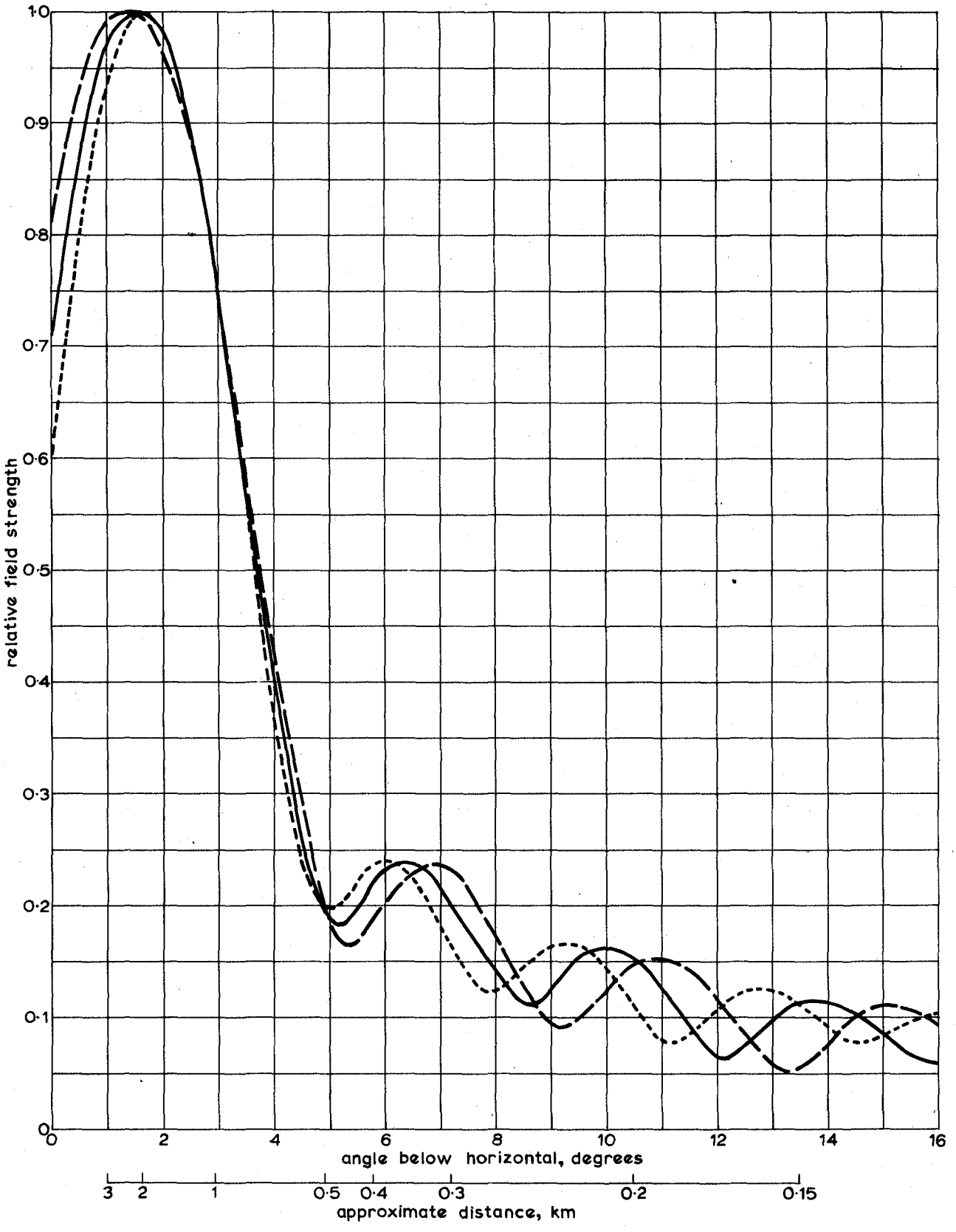

Fig. 6 Vertical radiation pattern

— — — 710 Mc/s ——— 790 Mc/s ---------- 870 Mc/s

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